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M60069PCT

WHAT IS CLAIMED IS:

1. A heterobipolar transistor, comprising an emitter which includes a first semiconductor layer (9) made of a first semiconductor material and a second semiconductor layer (8) made of a second semiconductor material, a band gap value of the first semiconductor material being smaller than a band gap value of the second semiconductor material, characterized in that a semiconductor intermediate layer (10) made of an intermediate layer semiconductor material is disposed between the first semiconductor layer (9) and the second semiconductor layer (8) and that a band gap value of the intermediate layer semiconductor material is greater than the band gap value of the first semiconductor material and smaller than the band gap value of the second semiconductor material.
2. The heterobipolar transistor as claimed in claim 1, characterized in that the intermediate layer semiconductor material is lattice adapted to the first semiconductor material and/or the second semiconductor material.
3. The heterobipolar transistor as claimed in claim 2, characterized in that the band gap value of the intermediate layer semiconductor material equals half the sum of the band gap value of the first semiconductor material plus the band gap value of the second semiconductor material.
4. The heterobipolar transistor as claimed in claim 1, characterized in that the first semiconductor material comprises InGaAs, the second semiconductor material comprises InP, and the intermediate layer semiconductor material comprises InGaAsP.
5. The heterobipolar transistor as claimed in claim 1, characterized in that the first semiconductor material comprises InGaAs, the second semiconductor material comprises InAlAs, and the intermediate layer semiconductor material comprises AlGaInAs.

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6. The heterobipolar transistor as claimed in claim 1,
characterized in that a sequence of n ($n \geq 2$) stacked
semiconductor intermediate layers (31, 32, 33) constituted by
the semiconductor intermediate layer (31) and at least one
5 other semiconductor layer (32) made of another intermediate
layer semiconductor material are disposed between the first
semiconductor layer (9) and the second semiconductor layer (8),
that the at least one other semiconductor layer (32) is
disposed between the semiconductor intermediate layer (31) and
10 the second semiconductor layer (8), and that a band gap value
of the other intermediate layer semiconductor material is
greater than the band gap value of the intermediate layer
semiconductor material and smaller than the band gap value of
the second semiconductor material.
- 15 7. The heterobipolar transistor as claimed in claim 6,
characterized in that the first semiconductor material has a
band gap value B_e , the second semiconductor material has a band
gap value B_z , and an intermediate layer semiconductor material
of a j^{th} of the n semiconductor intermediate layers ($2 \leq j \leq n$)
20 has a band gap value B_j , where
- $$B_j = B_e + j \cdot (1/(1+n)) \cdot (B_z - B_e).$$
8. The heterobipolar transistor as claimed in claim 6 or 7,
characterized in that the number n of the semiconductor inter-
mediate layers (31, 32, 33) constituting the sequence is
25 selected such that a quasi linear transition is obtained
between the band gap value of the first semiconductor material
and the band gap value of the second semiconductor material due
to the band gap values of the intermediate layer semiconductor
materials disposed between the first semiconductor material and
30 the second semiconductor material
9. The heterobipolar transistor as claimed in claim 1,
characterized in that the first semiconductor layer (9) is
contacted metallically.

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10. The heterobipolar transistor as claimed in claim 1,
characterized in that a further semiconductor layer (7) borders
on the second semiconductor layer (8) at a side remote from the
semiconductor intermediate layers (10, 21, 22, 31, 32, 33), and
5 that the further semiconductor layer (7) borders on a base (5).

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